REMARKS

The claims are claims 1, 3, 5, 6, 8 and 10.

Claim 1 is amended in response to the rejection under 35 U.S.C. 101. Claims 2, 4, 7 and 9 are canceled.

Claims 1, 3 and 5 were rejected under 35 U.S.C. 101 as non-statutory subject matter. The OFFICE ACTION states that the claims "simply recite an abstract idea for converting digital audio signal."

Claim 1 recites statutory subject matter. Claim 1 now recites "receiving input digital audio data having a first time scale" and "converting the digital audio signal into an audio signal having a second time scale according to the desired time scale modification." This claim thus recites conversion of a thing (the input digital audio data having a first time scale) into a different thing (an audio signal having a second time scale). The utility of this conversion is noted in the application at page 2, lines 2 to 7 which state:

> "Time-scale modification (TSM) is an emerging topic in audio digital signal processing due to the advance of low-cost, high-speed hardware that enables real-time processing by portable devices. Possible applications include intelligible sound in fast-forward play, real-time music manipulation, foreign language training, etc."

Provision of intelligible sound in fast-forward play is a useful, concrete and tangible result. Accordingly, claims 1, 3 and 5 are statutory subject matter.

Claims 1, 3, 5, 6 and 8 were rejected under 35 U.S.C. 103(a) as made obvious by the combination of Laroche et al "Improved Phase Vocoder Time-Scale modification of Audio," IEEE TRANSACTIONS ON SPEECH AND AUDIO PROCESSING, Vol. 7, No. 3, May 1999 and Laroche U.S. Patent No. 6, 766,300.

Claims 1 and 6 recite subject matter not made obvious by the combination of Laroche et al and Laroche. Claims 1 and 6 recite calculating "a phase difference for each of a predetermined number of spectral lines near the dominant spectral line within each spectral band as the phase difference of the corresponding dominant spectral line" and calculating "a phase difference for other spectral lines of each spectral band by the phase vocoder algorithm." This recitation of claims 1 and 6 requires different treatment of different spectral lines within each spectral band. For a predetermined number of spectral lines near the dominant spectral line the calculated phase difference corresponds to the phase difference of the dominant spectral line. For other spectral lines the phase difference is calculated by the phase vocoder algorithm. The OFFICE ACTION cites page 329, column 1, paragraph 3 and the last 15 lines of Laroche et al as making obvious both these recitations. The Applicants submit that Laroche et al clearly teaches that phase difference calculation for all peaks is the same. The bottom of page 330, column 1 of Laroche et al (within the portion cited by the Examiner) includes:

> "4) For each channel around the peak channel, calculate analysis phase difference between peak and current channel, and calculate current synthesis phase using (16).
> "5) Repeat the above steps for the next peak, until all peaks have been processed."

The above quoted paragraph 5) from Laroche et al states that phase calculation for all peaks is the same. This is contrary to the requirement of claims 1 and 6 that "a predetermined number of spectral lines near the dominant spectral line" have a different phase calculation than "other spectral lines." Explicitly stating that the phase calculation for all peaks is the same fails to make obvious the differing phase calculation claimed. Accordingly,

claims 1 and 6 are allowable over the combination of Laroche et al and Laroche.

Claims 1 and 6 recite yet further subject matter not made obvious by the combination of Laroche et al and Laroche. The cited teaching of Laroche et al fails to make obvious either phase calculation technique recited in claims 1 and 6. Paragraph 4) quoted above refers to equation (16) detailed in Laroche et al page 330, column 1, lines 11 to 21 and described as scaled phase locking. This portion of Laroche et al states:

> "This being done, the neighboring channels can be synchronized to the peak, and the identity phase-locking equation can be generalized as

$$\angle Y(t_s^u,\Omega_k) = \angle Y(t_s^u,\Omega_{k_i}) + \beta\left[\angle X(t_a^u,\Omega_k) - \angle X(t_a^u,\Omega_{k_i})\right] \quad (16)$$

> "where β is a phase scaling factor. Identity phase locking is simply β = 1. Exactly how the phases should be modified upon synthesis to ensure proper vertical phase coherence is not easy to assess, as explained in Section II-B1. However, it appears that identity phase locking can be further improved by setting β to a value between one and α."

Equation (16) of Laroche et al fails to teach either phase calculation recited in claims 1 and 6. Equation (16) calculates the phase of the non-dominant peaks as a sum of the phase calculated for the dominant peak ($\angle Y(t_s^u,\Omega_{k_i})$) and a weighted portion of the input phase difference ($\beta\left[\angle X(t_a^u,\Omega_k) - \angle X(t_a^u,\Omega_{k_i})\right]$). The OFFICE ACTION states that this makes obvious both recited phase calculations. However, the OFFICE ACTION fails to demonstrate that this teaching of Laroche et al makes obvious either calculation technique recited in claims 1 and 6 by detailed comparison of the technique taught in Laroche et al and the recitations of claims 1

and 6. This application distinguishes the invention over scaled phase locking at page 3, lines 10 and 12. Thus the application states these are different techniques. Without any argument to rebut this teaching of the application, the OFFICE ACTION fails to make a case for unobviousness. Accordingly, claims 1 and 6 are allowable over the combination of Laroche et al and Laroche.

Claims 3 and 8 recite subject matter not made obvious by the combination of Laroche et al and Laroche. Claims 3 and 8 recite merging "nearby spectral lines that are within a predetermined frequency range of each other prior to calculating the phase difference." The OFFICE ACTION cites Laroche et al at page 330, column 2, the last 5 lines and page 325, column 1, the second paragraph as making obvious this limitation. The first cited portion of Laroche et al states:

> "Once the instantaneous frequency at time is estimated, the phase of the time-scaled STFT at time is set according to the following *phase-propagation* formula
>
> $$\angle Y\left(t_s^u,\Omega_k\right)=\angle Y\left(t_s^{u-1},\Omega_k\right)+R_s\,\hat{\omega}\left(t_a^u\right) \qquad (6)$$
>
> "Equation (6) guarantees what can be called 'horizontal phase coherence': for a *constant-frequency* sinusoid, successive short-time signals will overlap coherently. Another way of saying this is that there is coherence *within* each frequency channel over time (i.e., along the horizontal dimension of a standard sonagram)."

The second cited portion of Laroche et al states:

> "Table II presents the consistency measure for the speech signal. Again, our phase-synchronization techniques outperform loose phase locking, but some marginal improvement in consistency can be obtained by the iterative procedure, with a large number of iterations. Also included is the consistency measure for pitch-synchronous overlap add (PSOLA), a high-quality time-domain technique based on overlap-adding small segments of waveform [7]."

The Applicants submit these teachings of Laroche et al include no mention of the claimed spectral lines or any equivalent, or of the claimed merging or any equivalent. The teaching that the "short-time signals will overlap coherently" and the "overlap-and adding small segments of waveform" taught in these portions of Laroche et al refer to overlap in time during the synthesis in constructing the time scale modified final signal. This corresponds to the inverse discrete Fourier transform calculation recited in both claims 1 and 6. The Applicants respectfully submit that data frames overlapping in time cannot make obvious the merging of spectral lines recited in claims 3 and 8. Accordingly, claims 3 and 8 are not made obvious by the combination of Laroche et al and Laroche.

Claim 5 recites subject matter not made obvious by the combination of Laroche et al and Laroche. Claim 5 recites partitioning "the spectrum into a plurality of contiguous spectral bands according to a Bark scale by adjusting boundaries of spectral bands to maintain important frequency groups within the same spectral band." This subject matter is the same as allowable claim 10 and is likewise allowable.

The Applicants respectfully submit that all the present claims are allowable for the reasons set forth above. Therefore early reconsideration and advance to issue are respectfully requested.

If the Examiner has any questions or other correspondence regarding this application, Applicants request that the Examiner contact Applicants' attorney at the below listed telephone number and address to facilitate prosecution.

Texas Instruments Incorporated
P.O. Box 655474 M/S 3999
Dallas, Texas 75265
(972) 917-5290
Fax: (972) 917-4418

Respectfully submitted,

/Robert D. Marshall, Jr./
Robert D. Marshall, Jr.
Reg. No. 28,527